

حمل الآن

مجاناً وحصرياً

امتحانات رقم (1)

الترم الاول



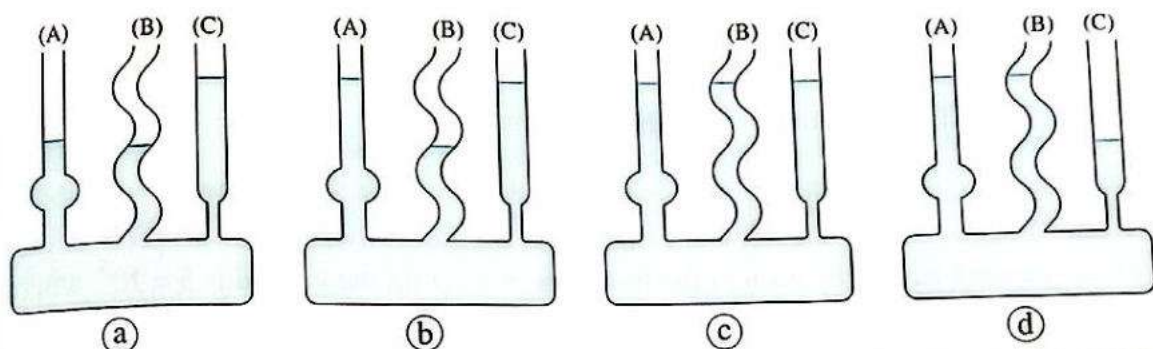
Exam 1 ?

Answered

Choose the correct answer (1 : 20):

- 1 Which of the following pairs of quantities represent two fundamental physical quantities?
- (a) Force and displacement. (b) Absolute temperature and speed.
(c) Amount of substance and time. (d) Luminosity and volume.

- 2 Which of the following figures represents the correct height of water if you know that the bases of the three vessels are in the same horizontal level?



- 3 If the dimensional formula of quantity x is LT^{-1} and the dimensional formula of quantity y is ML^{-1} , then the dimensional formula of quantity z that satisfies the equation $x = \sqrt{\frac{z}{y}}$ is
- (a) MLT^{-1} (b) MLT^{-2} (c) ML^2T (d) MLT

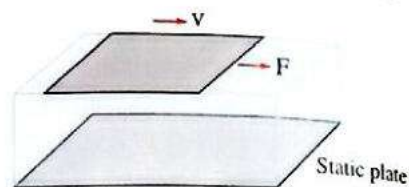
- 4 A quantity of nitrogen gas has a volume of 2 liters at STP. If its temperature is raised by a value of 27°C while holding its volume constant, the gas pressure becomes
- (a) 0.9 atm (b) 1.1 atm (c) 2.09 atm (d) 2.19 atm

- 5 A gas bubble had a volume V_{01} at a depth of 10 m below the sea surface where the temperature is 4°C . While it rose up and just before reaching the water surface where the temperature is 25°C , its volume became 0.8 cm^3 . So the value of V_{01} is equal to
(Given that: $g = 10\text{ m/s}^2$, $\rho_{\text{water}} = 1025\text{ kg/m}^3$, $P_a = 10^5\text{ N/m}^2$)
- (a) 0.185 cm^3 (b) 0.37 cm^3 (c) 0.74 cm^3 (d) 1.48 cm^3

- 6 If a horizontal force F acts on a stationary car and moves it forward a certain distance with uniform acceleration, this means the value of the frictional force is
- (a) greater than F (b) less than F
(c) equal to F (d) the answer cannot be determined

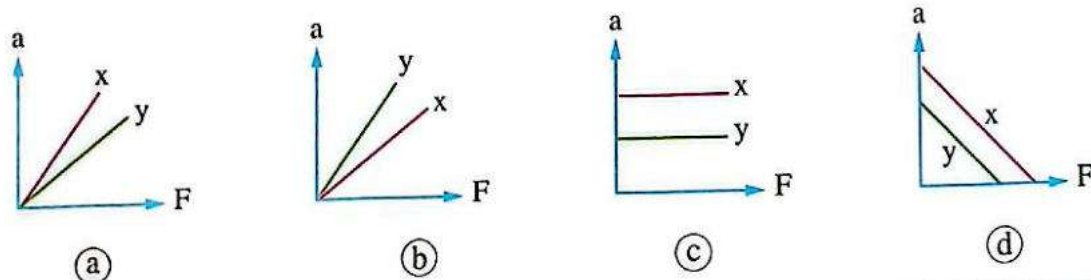
- 7 A quantity of gas has a volume of 4 L at a temperature of 20°C . If its temperature is raised to 100°C while its pressure remains constant, its volume becomes
- (a) 4.09 L (b) 5.09 L (c) 4.9 L (d) 5.9 L

- 8 A layer of liquid (x) is placed between two plates, then a tangential force of 100 N is applied to the upper plate, causing it to move at a constant velocity of 0.2 m/s, as shown in the opposite figure. When the layer of liquid (x) is replaced with another liquid (y) of the same thickness, a tangential force of 50 N causes the upper plate to move at a constant velocity of 0.4 m/s, then the ratio between the viscosity coefficients of the two liquids $\left(\frac{(\eta_{vs})_A}{(\eta_{vs})_B}\right)$ is



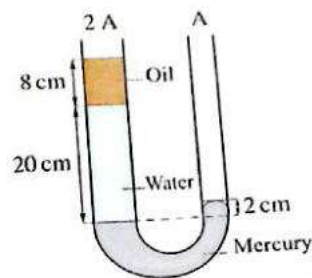
- 9 If the pressure caused by each of the four tires of a car on the ground is $5 \times 10^5 \text{ N/m}^2$ and the contact area of one tire with the ground is 50 cm^2 , then the mass of the car equals (Given that: $g = 10 \text{ m/s}^2$)
- (a) 250 kg (b) 500 kg (c) 1000 kg (d) 2500 kg

- 10 Two bodies, x and y, have masses m and 3 m, respectively. Which of the following graphs represents the relation between the acceleration (a) of the two bodies and the net force (F) acting on each of them?

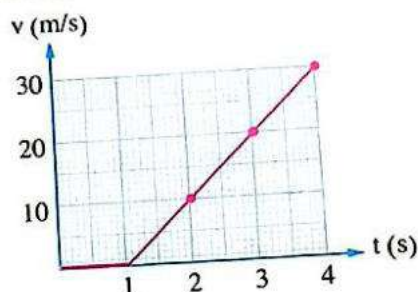


- 11 A dry, empty container has a mass of 200 g. When it is filled with a liquid of relative density 0.75, the total mass of the container and liquid becomes 500 g. So, if this container is filled with water, the total mass of the container and water becomes (Given that: density of water = 1 g/cm^3)
- (a) 300 g (b) 350 g (c) 400 g (d) 600 g

- 12 The opposite figure shows a U-shaped tube containing three balanced liquids, so the density of the oil is
(Take: $\rho_w = 1000 \text{ kg/m}^3$, $\rho_{Hg} = 13600 \text{ kg/m}^3$)



- 13 The opposite figure illustrates the (velocity-time) graph for an object, so its total displacement is

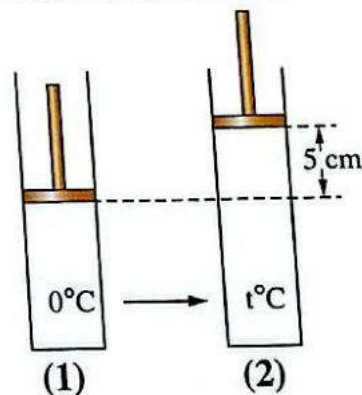


- 14 Two equal volumes of two different, non-reacting liquids with densities of 1000 kg/m^3 and 2000 kg/m^3 are mixed. Neglecting the change in volume due to mixing, the density of the mixture is

- 15 When a mercury barometer is raised from sea level to 107 m, the approximate decrease in the mercury level in the barometric tube will be
(Given that: the average density of air = 1.3 kg/m^3 , the density of mercury = 13600 kg/m^3)

- 16 A body moves at a constant velocity of 2 m/s. If a net force of 8 N acts on it in the same direction of its motion for 5 s, the change in its momentum during this time interval is

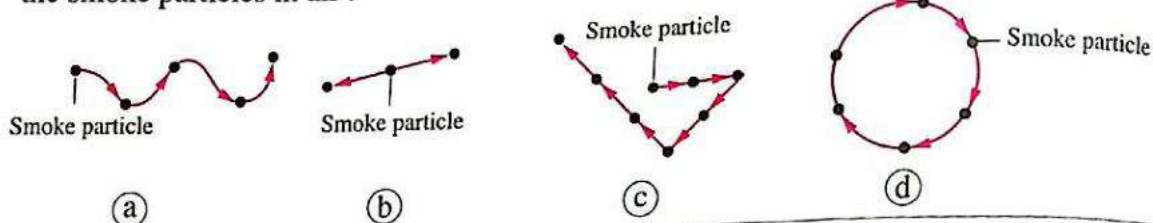
- 17 Figure (1) shows a cylindrical container of cross-sectional area 66 cm^2 equipped with a movable frictionless piston that traps an amount of gas of volume 1000 cm^3 at temperature 0°C . When the temperature of the gas is raised to $t^\circ\text{C}$, the piston moved 5 cm upwards as in figure (2). Supposing that the gas pressure is held constant, then the approximate value of t is



- (a) 9°C (b) 27°C (c) 70°C (d) 90°C

- 18 A car of mass 1000 kg moves at a uniform velocity of 12 m/s eastward, so the net force acting on the car is
 (a) 12000 N (b) 1200 N (c) 1012 N (d) 0

- 19 Which of the following figures could represent the path of the motion of one of the smoke particles in air?



- 20 When a horse pulls a cart, the force that directly causes the horse to move forward is
 (a) the force exerted by the horse on the cart
 (b) the force exerted by the cart on the horse
 (c) the force exerted by the ground on the cart
 (d) the force exerted by the ground on the horse

Answer the following (21 : 24):

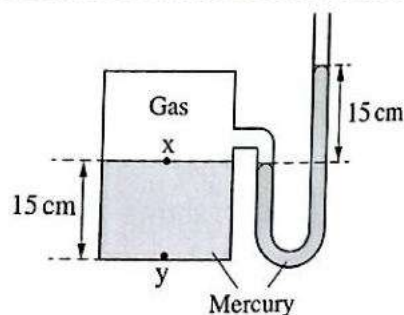
- 21 Explain why firefighters use hoses with narrow nozzles when extinguishing fires as shown in the opposite figure, and what would happen if hoses with a wider end were used?



- 22 Can a car move eastward while its acceleration is westward? Explain your answer.

- 23 The opposite figure shows a mercury manometer connected to a tank containing gas and a quantity of mercury. Calculate the pressure at the two points x and y in cm Hg.

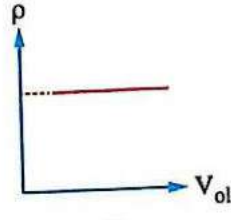
(Where: The atmospheric pressure = 76 cm Hg)



- 24 In an ideal hydraulic press, the cross-sectional area of its large piston is four times the cross-sectional area of its small piston. If the two pistons were balanced at the same horizontal level and the small piston is moved a distance of 0.1 m under the effect of a force of 400 N, calculate the distance moved by the large piston.

Answered

- 2** The graph that represents the relation between volume (V_{ol}) and density (ρ) of copper for a number of copper cubes at a definite temperature is

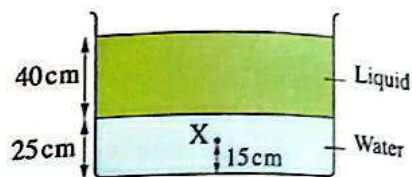


- (a) 17.5 cm (b) 18.5 cm (c) 20 cm (d) 30.5 cm

- 7 In the opposite figure, if the total pressure at point X is $1.043 \times 10^5 \text{ N/m}^2$, the density of the liquid equals

(Where: $\rho_{\text{water}} = 10^3 \text{ kg/m}^3$, $P_a = 10^5 \text{ N/m}^2$, $g = 10 \text{ m/s}^2$)

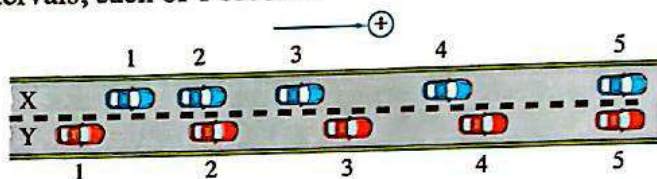
- (a) 750 kg/m^3 (b) 800 kg/m^3 (c) 825 kg/m^3 (d) 900 kg/m^3



- 8 A book rests on a tabletop placed on the Earth's surface. If the Earth affects the book by an attraction force $\vec{F}_1 = 10 \text{ N}$, so the table affects the book by a force ($\vec{F}_2$) equal to

- (a) 10 N (b) 100 N (c) -10 N (d) -100 N

- 9 The following figure shows the positions of two cars, X and Y, moving to the right at successive time intervals, each of 1 second.



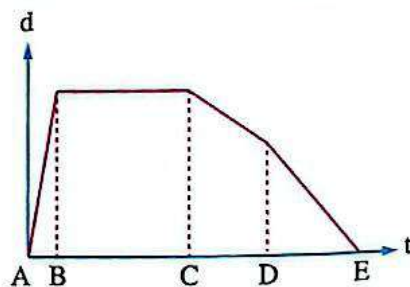
Which of the following statements correctly describes the motion of the two cars?

- (a) The two cars move with non-uniform velocity.
 (b) Car X moves with uniform velocity, while car Y moves with uniform acceleration.
 (c) Car X moves with negative acceleration, while car Y moves with uniform velocity.
 (d) Car X moves with positive acceleration, while car Y moves with uniform velocity.
- 10 In an ideal hydraulic press, the ratio of the areas of its pistons is $\frac{1}{16}$. If a force does work W when pushing the piston in the narrow branch downwards, the work done by the liquid on the piston in the wide branch equals

- (a) $\frac{W}{2}$ (b) W (c) $2W$ (d) $4W$

- 11 The opposite graph represents the relation between the displacement (d) and the time (t) for a car that moves in a straight line, so in which interval the velocity of the car is the greatest?

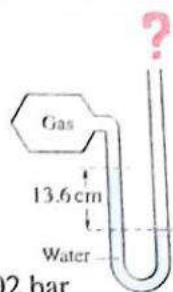
- (a) Interval AB. (b) Interval BC.
 (c) Interval CD. (d) Interval DE.



- 12 A liquid flows steadily through a main pipe x, of cross-sectional area 26 cm^2 , which branches into two pipes, y and z, of cross-sectional areas 15 cm^2 and 7 cm^2 , respectively. If the liquid speed in pipes x and y is 0.4 m/s and 0.6 m/s , respectively, then the speed of the liquid flow in pipe z equals

- (a) 0.2 m/s (b) 0.3 m/s (c) 0.5 m/s (d) 0.7 m/s

- 13 In the opposite figure, a water manometer is being used to measure the gas pressure in a tank. If the atmospheric pressure is 76 cm Hg, the density of mercury is 13600 kg/m^3 , the density of water is 1000 kg/m^3 and the acceleration due to gravity is 10 m/s^2 , then the pressure of the trapped gas equals

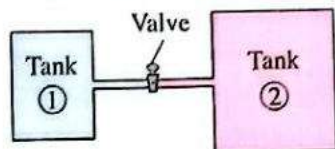


- (a) 1.09 bar (b) 1.07 bar (c) 1.05 bar (d) 1.02 bar

- 14 A quantity of an ideal gas has a volume of 10 m^3 at a temperature of 273°C . If its temperature decreases to 10°C and its volume decreases to 5 m^3 , then

- (a) its pressure does not change (b) its pressure increases
(c) its density does not change (d) its density decreases

- 15 The opposite figure shows two glass tanks ① and ② of volumes 100 cm^3 and 150 cm^3 respectively connected together through a valve on a tube of negligible volume.



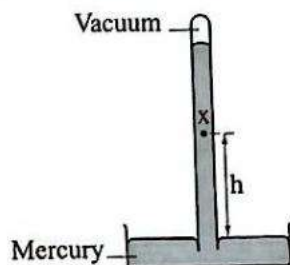
Tank ① contains carbon dioxide gas at a pressure of 80 cm Hg and tank ② contains helium gas at a pressure of 76 cm Hg. If the valve between the tanks is opened, the pressure inside the tanks at constant temperature becomes

- (a) 76.8 cm Hg (b) 77.6 cm Hg (c) 88.4 cm Hg (d) 79.2 cm Hg

- 16 The opposite figure shows a mercury barometer being used to determine the atmospheric pressure where it is found to be 75 cm Hg, so if the pressure at point x equals $46.648 \times 10^3 \text{ N/m}^2$, height h equals

(Take: $\rho_{\text{Hg}} = 13600 \text{ kg/m}^3$, $g = 9.8 \text{ m/s}^2$)

- (a) 20 cm (b) 25 cm
(c) 30 cm (d) 40 cm



- 17 A dry, empty container has a mass of 190 g. When it gets filled with a liquid of relative density 0.81, the total mass of the container and the liquid together becomes 400 g. If this container is filled with water, the approximate total mass of the container and water becomes (Given that: density of water = 1 g/cm^3)

- (a) 299 g (b) 349 g (c) 399 g (d) 449 g

- 18 A quantity of an ideal gas was put in a well sealed container at a temperature of 27°C so that its pressure was P. If its temperature is raised while its volume is kept constant and its pressure becomes 2P, hence its final temperature, neglecting the expansion of the container, is

- (a) 327°C (b) 450°C (c) 500°C (d) 600°C

- 19 A U-shaped tube, with two branches of height 16 cm and a ratio of cross-sectional areas $\frac{1}{3}$, contains a quantity of liquid (x) of density 1800 kg/m^3 and a height 8 cm. If another liquid (y), immiscible with liquid (x) and having a density of 800 kg/m^3 , is poured into the narrow branch until it reaches the edge of the branch at equilibrium, the height of liquid (y) is

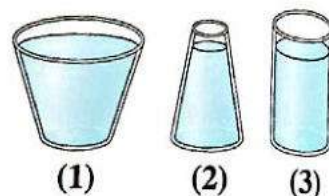
- (a) 10 cm (b) 12 cm (c) 14 cm (d) 16 cm

- 20** A net force of magnitude F acts on a body of mass m , giving it an acceleration of magnitude a . If a net force of magnitude $4F$ acts on a body of mass $2m$, the magnitude of the acceleration acquired by the second body is
- (a) $\frac{a}{2}$ (b) a (c) $2a$ (d) $4a$

Answer the following (21 : 24):

- 21** Why is it preferable to repeat a measurement several times and **calculate** the average of the measurements obtained when carrying out a measurement process?
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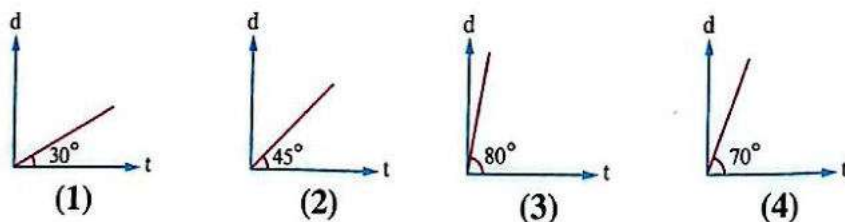
- 22** The opposite figures show three containers with equal base areas placed on the same horizontal level. A quantity of water is poured into each until the water height is equal in all of them. **Explain** why the pressing forces acting on the base of the each of the three containers are equal.



- 23** In an experiment to verify Charles's law, the length of the trapped air column was 8.19 cm at the melting point of ice and when the air was heated to 50°C , its length became 9.69 cm. **Calculate** the volume expansion coefficient of the air at constant pressure, neglecting the expansion of the glass.
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- 24** The following graphs represent the relation between displacement (d) and time (t) for four bodies of the same mass. **Which** of these graphs represents the body with the greatest momentum? **With explanation.**

(Given that: The axes are represented with the same scale)



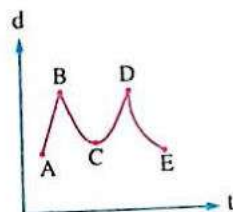
Exam 3 ?

Answered

Choose the correct answer (1 : 20):

- 1 The opposite figure represents the (displacement-time) graph for a body that moves in a straight line, so the net force acting on the body equals zero during

(a) AB (b) BC
(c) CD (d) DE



- 2 A body moved in a straight line a distance of 100 m at a speed of 10 m/s, then moved in the same direction a distance of 200 m at a speed of 5 m/s. So, the average velocity of the body through its entire journey is

(a) 7.5 m/s (b) 6 m/s (c) 8 m/s (d) 30 m/s

- 3 A force of 50 N is acting on a hydraulic press small piston of radius 1.5 cm to lift a mass of 245 kg placed on the big piston. Given that the two pistons are balanced against each other at the same horizontal level where the acceleration due to gravity is 10 m/s^2 , so

	The mechanical advantage	The radius of the big piston
(a)	49	21 cm
(b)	98	21 cm
(c)	49	10.5 cm
(d)	98	10.5 cm

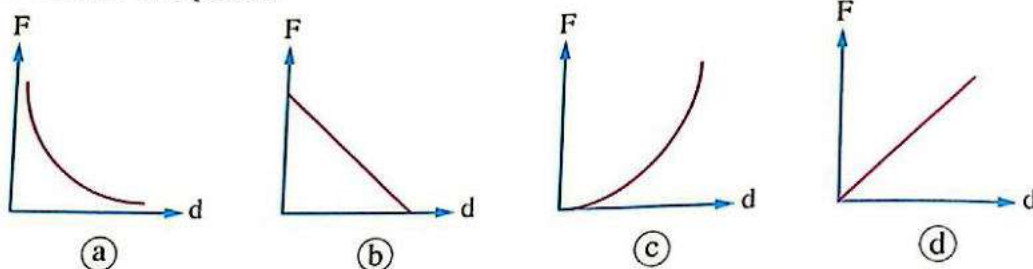
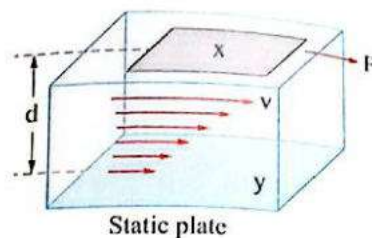
- 4 Two trains are moving on two parallel straight tracks in opposite directions at the same speed of 90 km/h. If the distance between them at a certain moment is 8.5 km, their fronts will meet after from that moment.

(a) 0.05 s (b) 50 s (c) 120 s (d) 170 s

- 5 A cylindrical container equipped with a frictionless movable piston traps a certain amount of gas with a volume of 20 L at a temperature of 27°C . The increase in temperature required to expand the gas volume to 30 L while keeping its pressure constant is

(a) 150°C (b) 177°C (c) 450°C (d) 600°C

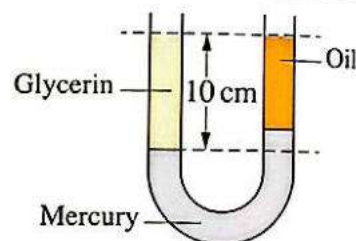
- 6 A plate x is required to be moved at a uniform velocity (v) on the surface of a liquid parallel to a static plate y as shown in the opposite figure. Which of the following graphs represents the relation between the force (F) required to move plate x at the uniform velocity v and the distance (d) between the two plates?



- 7 Water flows steadily in a main pipe that branches into a number of identical branched pipes. If the diameter of the main pipe is eight times the diameter of the branched pipe and the speed of water flow in the branched pipe is four times its speed of flow in the main pipe, then the number of branched pipes is

(a) 4 (b) 8 (c) 16 (d) 24

- 8 A U-shaped tube of uniform cross-sectional area contains three different liquids which are glycerin, mercury and oil, their relative densities are 1.3, 13.6 and 0.8 respectively. At equilibrium as shown in the opposite figure, the height of the oil column equals



(a) 10.4 cm (b) 8.2 cm (c) 7.2 cm (d) 9.6 cm

- 9 A quantity of air has a volume of $2.1 \times 10^{-3} \text{ m}^3$ under a pressure of $1.013 \times 10^5 \text{ N/m}^2$ and a temperature of 303 K. If the air pressure is increased to $1.107 \times 10^6 \text{ N/m}^2$ and the volume of the air quantity becomes $3 \times 10^{-4} \text{ m}^3$, the final temperature of this quantity will approximately be

(a) 200°C (b) 653 K (c) 564 K (d) 473°C

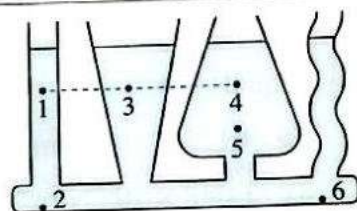
- 10 Which of the following operations is considered an indirect measurement?

(a) Measuring the mass of a body using a balance.
 (b) Measuring the volume of a liquid with a graduated cylinder.
 (c) Measuring the area of a room using a measuring tape.
 (d) Measuring the density of a liquid with a hydrometer.

- 11 If x and y are two physical quantities where the dimensional formula of x is LT^{-2} and the dimensional formula of y is ML^{-1} , which row of the following choices represents the dimensional formulae of the shown quantities?

	$\frac{y}{x}$	$x + y$
(a)	MLT^2	MLT^{-2}
(b)	$ML^{-2}T^{-2}$	MLT
(c)	MLT^2	Impossible
(d)	$ML^{-2}T^2$	Impossible

- 12 The opposite figure shows interconnected vessels containing a homogeneous liquid with their bases at the same horizontal level, so at equilibrium, the pressures are equal at points



- (a) 1, 2 (b) 4, 5 (c) 3, 4 (d) 6, 3

- 13 The opposite figure shows a cylinder of uniform cross-sectional area equipped with a frictionless movable piston trapping a quantity of gas of volume V_{ol} at $0^\circ C$. If the gas temperature has increased to $546^\circ C$ while keeping the pressure constant, then the change in the gas volume is



- (a) V_{ol} (b) $2 V_{ol}$ (c) $3 V_{ol}$ (d) $4 V_{ol}$

- 14 A quantity of gas has a density of 1.25 kg/m^3 under a pressure of 1 atm. If the gas pressure increases to 1.5 atm while its temperature remains constant, its density becomes

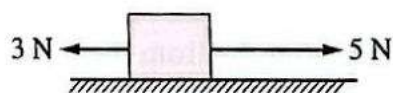
- (a) 0.875 kg/m^3 (b) 1.75 kg/m^3 (c) 1.875 kg/m^3 (d) 2.075 kg/m^3

- 15 If the difference in atmospheric pressure between two locations, one at the base of a mountain and the other at its summit, is $2 \times 10^4 \text{ Pa}$, the approximate height of the mountain is

(Given that: Average density of air = 1.29 kg/m^3 , acceleration due to gravity = 9.8 m/s^2)

- (a) 1491 m (b) 1510 m (c) 1582 m (d) 1641 m

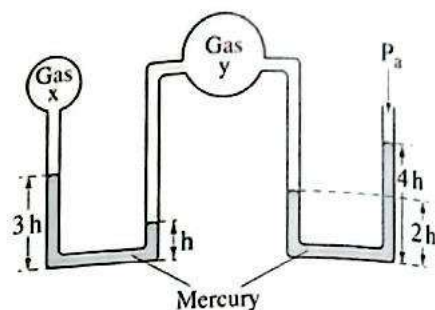
- 16 The opposite figure shows a box that moves with constant velocity on a horizontal surface under the effect of many forces, then the frictional force is



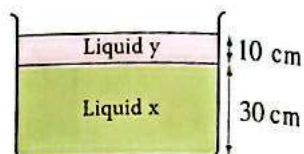
- (a) 2 N (b) 3 N (c) 4 N (d) 5 N

- 17 From the opposite figure, the pressure difference between the pressure of gas x and the atmospheric pressure is

(a) zero (b) h
(c) $2h$ (d) $3h$

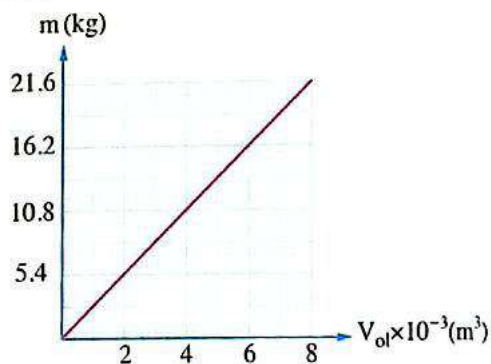


- 18 A tank contains two immiscible liquids (x and y) of densities 900 kg/m^3 and 800 kg/m^3 having heights as shown in the opposite figure, given that the atmospheric pressure is $1.013 \times 10^5 \text{ N/m}^2$ and the acceleration due to gravity is 10 m/s^2 , so the total pressure on the base of the container equals



(a) $4.123 \times 10^4 \text{ N/m}^2$ (b) $1.77 \times 10^4 \text{ N/m}^2$
(c) $1.048 \times 10^5 \text{ N/m}^2$ (d) $1.48 \times 10^5 \text{ N/m}^2$

- 19 The opposite graph shows the relation between the masses of a group of bodies made of a definite substance and the volume of each of them at 0°C . By using the following table that shows the densities of some substances at 0°C , these bodies are made of



(a) iron
(b) aluminum
(c) copper
(d) gold

Substance	Density (kg/m^3)
Iron	7900
Aluminum	2700
Copper	8900
Gold	19300

- 20 A car was moving at a speed of 30 m/s . Its driver applied the brakes, and the car moved with a negative acceleration of 6 m/s^2 . So the ratio of the car speed after 1 s to its speed after 2 s from the moment the brakes were applied equals

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{3}{2}$ (d) $\frac{4}{3}$

Answer the following (21 : 24):

- 21 An iron cube has a side length of 12 cm and a mass of 7 kg. If you know that the density of iron is 7800 kg/m^3 , **determine** whether this cube is solid or hollow.

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- 22 Two bodies move with the same momentum. The mass of the first is 5 kg and its speed is 20 m/s. If the mass of the second is 15 kg, **calculate** its speed.

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- 23 In an experiment to determine the pressure increasing coefficient of a gas at constant volume, the pressure of a certain amount of gas at 0°C was 10^5 Pa and when it was heated to 273°C , its pressure became $2 \times 10^5 \text{ Pa}$. **Calculate** the pressure increasing coefficient of the gas at constant volume.

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- 24 The image illustrates a player in a boat race, **hence extract a pair of forces** in this situation that represents action and reaction.



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Exam 4 ? Answered

Choose the correct answer (1 : 20):

- 1** A solid object in the shape of letter T is placed on a horizontal surface as shown in figure (1). If the object is inverted upside down to be as shown in figure (2), what happens to the force and the pressure by which it acts on the surface?

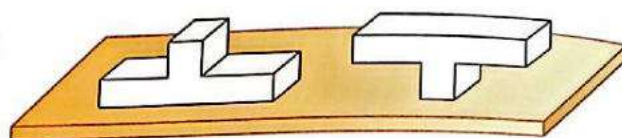
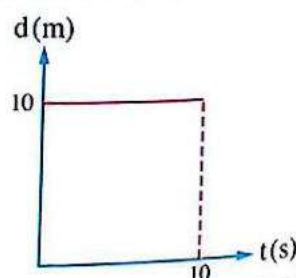


Figure (1)

Figure (2)

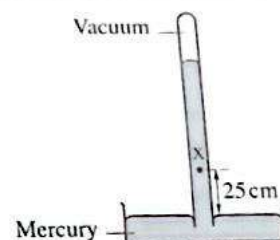
	Force	Pressure
(a)	Increases	Increases
(b)	Increases	Remains unchanged
(c)	Remains unchanged	Increases
(d)	Remains unchanged	Remains unchanged

- 2** A hydraulic press has two pistons with diameter ratio of $\frac{1}{5}$, so the ratio of the pressure directly under the small piston to the pressure directly under the large piston when the two pistons are balanced at the same horizontal level is
- (a) $\frac{1}{1}$ (b) $\frac{1}{25}$ (c) $\frac{1}{5}$ (d) $\frac{5}{1}$
- 3** If two equal volumes of two non-reacting liquids whose densities are ρ_1 and ρ_2 are mixed together, a mixture of volume that equals the sum of the volumes of the liquids before mixing is formed, so the density of the mixture equals
- (a) $\frac{\rho_1 + \rho_2}{2}$ (b) $2(\rho_1 + \rho_2)$ (c) $\frac{\rho_1 \rho_2}{\rho_1 + \rho_2}$ (d) $\frac{2 \rho_1 \rho_2}{\rho_1 + \rho_2}$
- 4** An amount of ideal gas is under pressure P and temperature 77°C . If the temperature of the gas is raised to 427°C while keeping its volume constant, the increase of its pressure equals
- (a) $\frac{P}{2}$ (b) P (c) $2P$ (d) $4P$
- 5** The opposite figure illustrates the displacement versus the time graph for an object of mass 2 kg , so the resultant force acting on it is
- (a) 100 N (b) 200 N
 (c) 102 N (d) 0



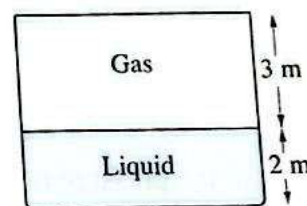
- 6 A square plate with a side length of 10 cm slides over another stationary plate and between the two plates there is a layer of a viscous liquid with a viscosity coefficient of 1.2 N s/m^2 . If the upper plate moves at a constant speed of 0.2 m/s due to a tangential force of 0.6 N, the thickness of the liquid layer is
- (a) 1 mm (b) 2 mm (c) 3 mm (d) 4 mm

- 7 The opposite figure shows a mercury barometer being used to determine the atmospheric pressure. If the atmospheric pressure is found to be 75 cm Hg, the pressure at point x equals
- (Take: $\rho_{\text{Hg}} = 13600 \text{ kg/m}^3$, $g = 9.8 \text{ m/s}^2$)



- 8 One centimeter = micrometer
- (a) 10^2 (b) 10^4 (c) 10^6 (d) 10^8

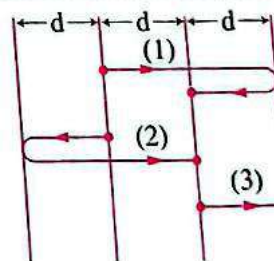
- 9 The opposite figure shows a closed tank containing a liquid of density 900 kg/m^3 and a gas of pressure 2 bars, so the total pressure affecting the bottom of the tank is
- (Take: $g = 10 \text{ m/s}^2$)



- 10 A stationary book placed on a table exerts a downward force on it, so the reaction force to this force is
- (a) the force exerted by the Earth on the book
(b) the force exerted by the table on the book
(c) the force exerted by the Earth on the table
(d) the force exerted by the book on the Earth

- 11 A quantity of gas has a volume of 273 cm^3 at 0°C . If its temperature rises to 10°C under constant pressure, the volume of the gas will be
- (a) 263 cm^3 (b) 273 cm^3 (c) 278 cm^3 (d) 283 cm^3

- 12 The opposite figure shows the motion path of three bodies during the same time period, so which of the three bodies have a greater average velocity?



- (a) Body (1) (b) Body (2) (c) Body (3)
(d) All the bodies have the same average velocity.

- 13** A gas reservoir, the difference between its pressure and the atmospheric pressure was 40.8 kPa, was connected to one of the arms of a manometer so that the height of the liquid column in the open arm of the manometer became 60 cm and the height of the liquid column in the arm connected to the reservoir became 30 cm, so using the opposite table, the liquid in that manometer was (Take: $g = 10 \text{ m/s}^2$)

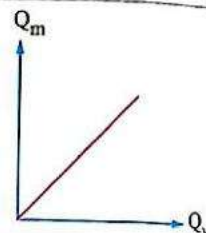
Liquid	Density (kg/m^3)
Mercury	13600
Water	10^3
Glycerin	1260
Oil	800

- (a) oil (b) water (c) mercury (d) glycerin

- 14** A car of mass 1000 kg started to move from rest with uniform acceleration so that its momentum after 2 s was $4 \times 10^3 \text{ kg.m/s}$. So, its momentum after 4 s from the start of motion will be

- (a) $8 \times 10^3 \text{ kg.m/s}$ (b) $16 \times 10^3 \text{ kg.m/s}$
(c) $4\sqrt{2} \times 10^3 \text{ kg.m/s}$ (d) $8\sqrt{2} \times 10^3 \text{ kg.m/s}$

- 15** The opposite graph represents the relation between the mass flow rate (Q_m) and the volume flow rate (Q_v) for a liquid that flows steadily in many tubes, then the slope of the straight line represents



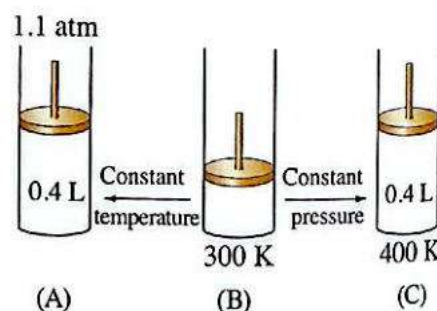
- (a) the pressure of the liquid (b) the temperature of the liquid
(c) the speed of the liquid flow (d) the density of the liquid

- 16** A cart with a mass of 1000 kg and another with a mass of 2000 kg move with the same acceleration. The net force acting on the cart with the larger mass is the net force acting on the cart with the smaller mass.

- (a) equal to (b) half (c) double (d) three times

- 17** The opposite figure illustrates the change in the conditions of an experiment on an amount of gas using a cylinder of constant volume and a movable frictionless piston, so

	The volume of the gas in case B (L)	The pressure of the gas in case B (atm)
(a)	0.3	2
(b)	0.3	1.47
(c)	0.7	2
(d)	0.7	1.47

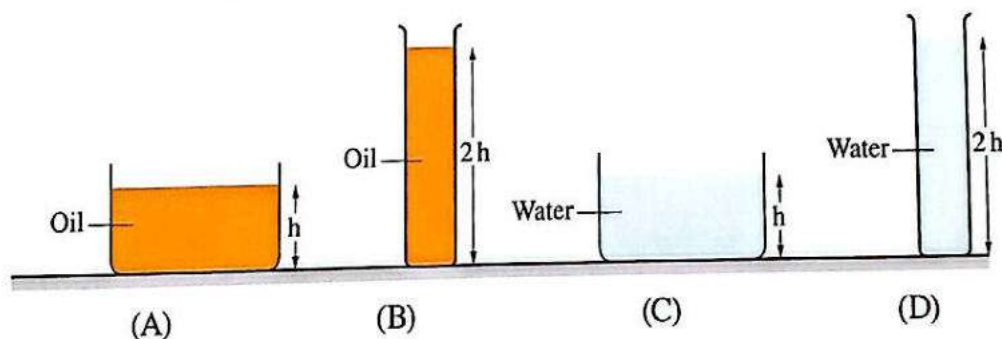


- 18 A person starts to move from rest in a straight line with uniform acceleration, till its speed reaches 4 m/s in a time of 8 s, so the value of its acceleration equals
- (a) 0.5 m/s^2 (b) 1 m/s^2 (c) 2 m/s^2 (d) 4 m/s^2
- 19 A gas bubble is produced from a diver's exhalation below the surface of water, what happens to the bubble volume and the pressure of water that affects it while it rises upwards till it reaches the surface of water?
- (a) Both increase. (b) The volume increases while pressure decreases.
(c) Both decrease. (d) The volume decreases while pressure increases.
- 20 A tank contains an amount of air that has density 1.3 kg/m^3 under the standard atmospheric pressure and a temperature of 27°C . If the temperature of this amount of air is lowered to 0°C and its pressure is increased to 1.8 atm, its density becomes
- (a) 0.39 kg/m^3 (b) 0.79 kg/m^3 (c) 2.13 kg/m^3 (d) 2.57 kg/m^3

Answer the following (21 : 24):

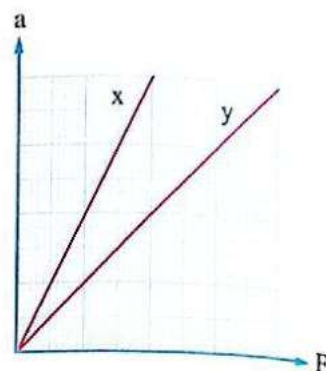
- 21 If you know that the unit of measurement for acceleration is m/s^2 and its dimensional formula is L^xT^y , what are the values of x and y?
-
-

- 22 A student filled two identical bowls (A and C) with two equal volumes of oil and water and also two identical cylinders (B and D) with two equal volumes of oil and water as shown in the following figures. If the relative density of oil is 0.8, **arrange** the four vessels in a descending order according to the acting pressure on the bottom of the vessel.

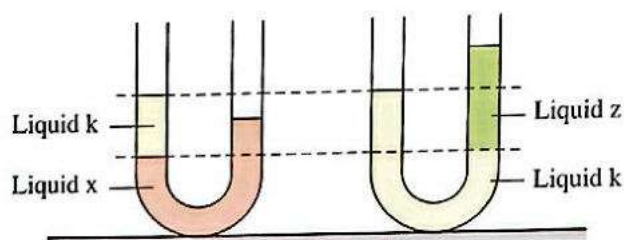


- 23** The opposite graph represents the relation between the acceleration (a) for two bodies, x and y , and the net force (F) acting on them.

Calculate the ratio between the masses of the two bodies $\left(\frac{m_x}{m_y}\right)$.



- 24** The following figure shows two identical U-shaped tubes of uniform cross-sections, each tube contains two of three liquids x , z and k . If the liquids are at equilibrium in the two tubes, **arrange with explanation** the liquids (x , z and k) in a descending order according to their densities.



Exam 5 ?

Answered

Choose the correct answer (1 : 20):

- 1 A cylindrical container is half filled with a liquid of density ρ , if more of this liquid is poured to fill the container at constant temperature, then the density of the liquid becomes

(a) $\frac{1}{2}\rho$ (b) 2ρ (c) $\frac{3}{2}\rho$ (d) ρ

- 2 In the opposite figure, as the boat gets closer to the shore while keeping its speed constant, the athlete needs to

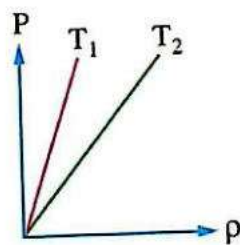


(a) row with a less force (b) row with a greater force
(c) row with the same force (d) stop rowing

- 3 Small rockets are used to change the speed of satellites. If one of these rockets acts on a satellite of mass 7200 kg with a pushing force of 3500 N, the time period for which the rocket must act on the satellite to increase its speed by 0.63 m/s is

(a) 0.864 s (b) 1.052 s (c) 1.296 s (d) 1.487 s

- 4 The opposite graph represents the relation between the pressure of an amount of gas (P) and its density (ρ) at two constant temperatures T_1 and T_2 , so T_1



(a) is greater than T_2 (b) is equal to T_2
(c) is less than T_2 (d) the answer is indeterminable

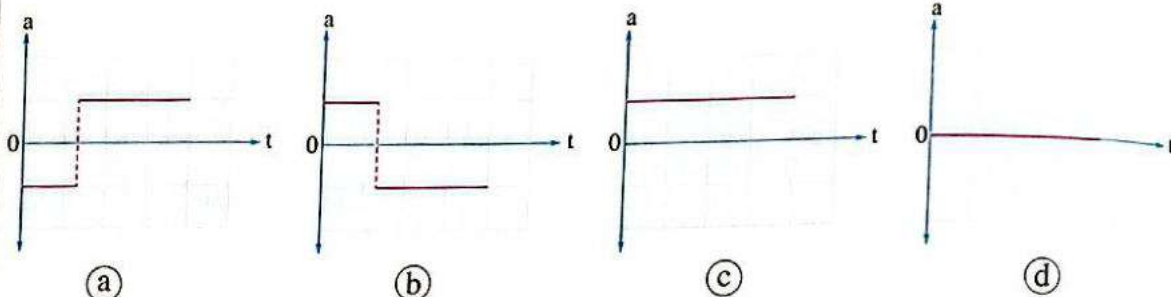
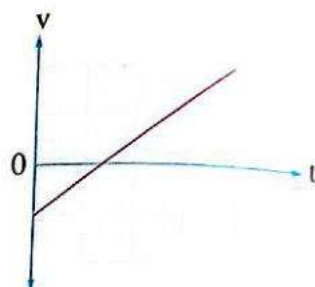
- 5 Two open boxes are placed next to each other, the first is cubic-shaped of length 20 cm and the second is cuboid-shaped whose base dimensions are 20 cm, 40 cm and its height is 30 cm, so the ratio between the forces due to air pressure on the bases of the two boxes ($\frac{F_1}{F_2}$) equals

(a) $\frac{1}{1}$ (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) $\frac{1}{4}$

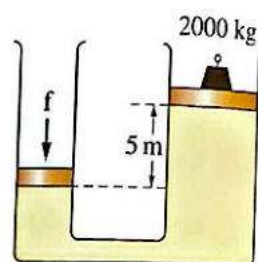
- 6 If the net force acting on a moving object is zero, this necessarily means its is zero.

(a) mass (b) velocity (c) acceleration (d) displacement

- 7 The opposite graph shows the change of the velocity of a body with the time, which of the following graphs describes the change of the body's acceleration with time?



- 8 The opposite figure shows a hydraulic press which has two pistons of cross-sectional areas 50 cm^2 and 2500 cm^2 . The apparatus is filled with oil of relative density 0.85. If the big piston supports a load of mass 2000 kg , the magnitude of the applied force on the small piston (f) to hold the system in equilibrium equals



(Where: $\rho_{\text{water}} = 1000 \text{ kg/m}^3$, $g = 10 \text{ m/s}^2$)

- (a) 400 N (b) 612.5 N (c) 800 N (d) 1225 N

- 9 A glass flask is open from the top at temperature 17°C , when it is heated up, an amount of air with a volume equivalent to the quarter of the volume of the flask has leaked out. By assuming that the flask doesn't expand and the pressure remains constant, the change of temperature inside the flask in Celsius is

- (a) 362.5°C (b) 106.5°C (c) 89.5°C (d) 72.5°C

- 10 An amount of a gas has a volume 450 cm^3 at 0°C . When the temperature of the gas has changed to an absolute temperature T while holding its pressure constant, its volume becomes V_{ol} , which of the following choices represents possible values for T and V_{ol} ?

	$T(\text{K})$	$V_{\text{ol}}(\text{cm}^3)$
(a)	300	550
(b)	364	541
(c)	423	600
(d)	364	600

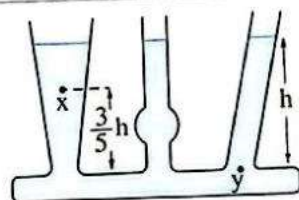
11 Which of the following pair of quantities represents derived physical quantities?

- (a) Mass and force.
- (b) Velocity and time.
- (c) Distance and acceleration.
- (d) Energy and density.

12 A car moves in a straight line at a speed of 88 km/h behind a truck that moves with a speed of 75 km/h and at a distance of 110 m from it. So, the time required for the car to catch up with the truck is

- (a) 0.67 s
- (b) 8.46 s
- (c) 2.43 s
- (d) 30.46 s

13 The opposite figure shows connected vessels that contain a liquid of density ρ , if the pressure of the liquid at point y is P, so the pressure of the liquid at point x equals

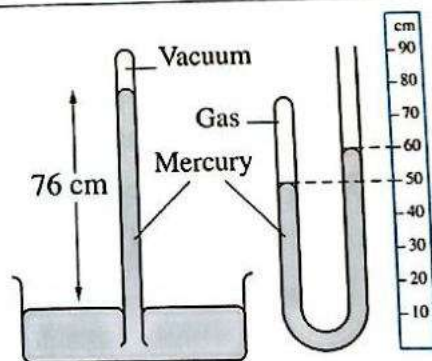


- (a) $\frac{2}{3} P$
- (b) $\frac{1}{3} P$
- (c) $\frac{3}{5} P$
- (d) $\frac{2}{5} P$

14 If power equals the product of force and velocity, then the unit of measurement for power is

- (a) $\text{kg} \cdot \text{m}^{-1} \cdot \text{s}^{-2}$
- (b) $\text{kg} \cdot \text{m}^2 \cdot \text{s}^{-3}$
- (c) $\text{kg} \cdot \text{m}^{-1} \cdot \text{s}^{-3}$
- (d) $\text{kg} \cdot \text{m}^2 \cdot \text{s}^{-2}$

15 The opposite figure shows a barometer placed beside a mercury manometer that enclosing an amount of gas in its closed arm, so the pressure of the enclosed gas in the manometer equals

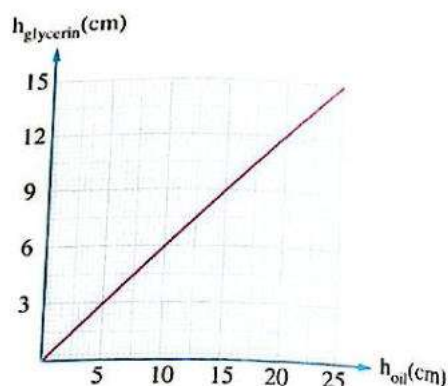


- (a) 0.87 atm
- (b) 1 atm
- (c) 1.13 atm
- (d) 1.26 atm

16 A truck loaded with sand is moving along a highway influenced by a constant force. If sand leaks at a constant rate through a hole in the truck, the truck acceleration

- (a) gets decreasing
- (b) gets increasing
- (c) remains constant
- (d) gets decreasing then increasing

- 17 A U-shaped tube contains an amount of glycerin whose density is 1260 kg/m^3 . Oil is poured gradually in one of the arms of the U-shaped tube and the opposite graph shows the relation between the height of oil and that of glycerin above the level of the separating surface between oil and glycerin at equilibrium, so the density of oil equals

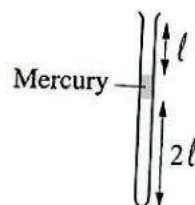


- (a) 672 kg/m^3 (b) 750 kg/m^3 (c) 756 kg/m^3 (d) 800 kg/m^3

- 18 An airplane flies at height of 2700 m above sea level. If the pressure inside the airplane equals the atmospheric pressure at sea level which is 76 cm Hg, the average density of air is 1.1 kg/m^3 and the density of mercury is 13600 kg/m^3 , so the difference between the air pressure inside and outside the airplane equals (Take: $g = 9.8 \text{ m/s}^2$)

- (a) zero (b) 21.8 cm Hg (c) 2.5 cm Hg (d) 73.4 cm Hg

- 19 The opposite figure shows a capillary tube of uniform cross-section that is closed at one end and contains a thread of mercury trapping an amount of air at temperature 27°C , so the highest temperature on Celsius scale that can be measured, if the tube is used as thermometer equals



(Assume that the pressure is constant and the expansions of mercury and glass are negligible)

- (a) 81°C (b) 177°C (c) 327°C (d) 627°C

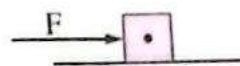
- 20 A beaker has a mass of 1 kg when it is completely filled with water. If a solid object of mass 375 g is put in the beaker, it displaces 40 g of water outside the beaker, so the relative density of the material of the object equals

- (a) 7.925 (b) 8.82 (c) 9.375 (d) 10.5

Answer the following (21 : 24):

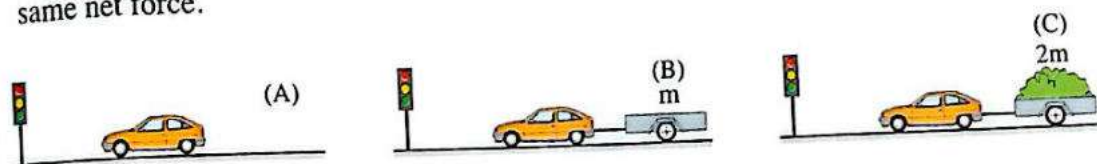
- 21 If an amount of mercury is put in Jolly's apparatus flask such that the volume of the mercury equals $\frac{1}{8}$ the volume of the flask, then the temperature of the flask is raised, will this apparatus be functional for determining the coefficient of increasing the pressure of air with temperature at constant volume?

- 22 In the opposite figure, a force F acts horizontally on a body which is placed on a horizontal surface, will the reaction force which acts on the body by the surface increase when increasing the magnitude of force F ? And why?



- 23 If water flows steadily with a speed of 1 m/s inside a tube of diameter 10 cm that ends with a nozzle of diameter 2.5 cm , calculate the mass of water that flows every minute through the nozzle of the tube. (Knowing that: The density of water $= 1000 \text{ kg/m}^3$, $\pi = 3.14$)

- 24 The following figures show three identical cars each of mass m , arrange the three cars ascendingly according to the maximum accelerations that could be reached by each of them after passing the traffic lights, assuming they all move under the influence of the same net force.



Exam 6 ? Answered

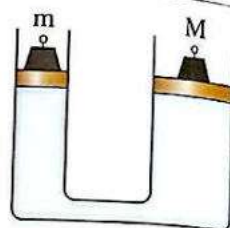
Choose the correct answer (1 : 20):

1 If the dimensional formula for density is $ML^{-3}T^0$ and its unit of measurement is kg^x/m^y , then

- (a) $x = 1, y = 2$ (b) $x = 2, y = -1$
 (c) $x = 1, y = 3$ (d) $x = 1, y = -3$

2 The figure shows an ideal hydraulic press in which the pistons are balanced. If the cross-sectional area of the large piston is three times the cross-sectional area of the small piston, the ratio of $\left(\frac{M}{m}\right)$ equals

- (a) $\frac{1}{3}$ (b) $\sqrt{3}$
 (c) $\frac{\sqrt{3}}{1}$ (d) $\frac{3}{1}$

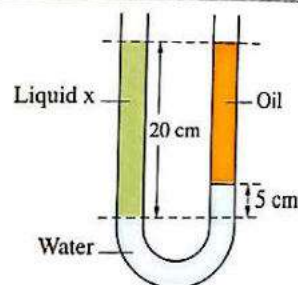


3 An object moves in a straight line with a uniform acceleration of 2 m/s^2 , so the change in its velocity during 3 s is

- (a) 2 m/s (b) 3 m/s (c) 5 m/s (d) 6 m/s

4 In the opposite figure, if the relative density of oil is 0.6, the relative density of liquid x is

- (a) 0.7 (b) 0.75
 (c) 0.8 (d) 0.85

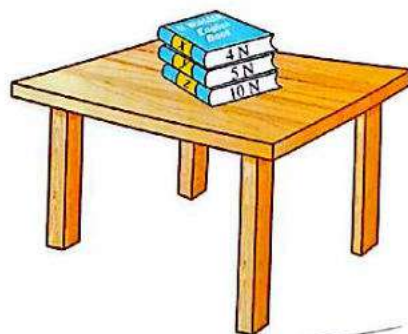


5 Which of the following quantities represent derived physical quantities?

- (a) Velocity - Distance - Time (b) Mass - Density - Volume
 (c) Work - Force - Distance (d) Work - Volume - Density

6 Three books x, y and z of weights 4 N, 5 N and 10 N respectively, are stable on a horizontal table surface as shown in the opposite figure, what is the magnitude of the reaction force of the table surface on book z?

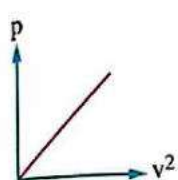
- (a) 5 N (b) 9 N
 (c) 10 N (d) 19 N



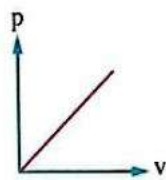
- 7 If the pressure of a contained gas in a tank is 2 atm, its pressure in the unit of m Hg equals
(Where: $P_a = 76 \text{ cm Hg}$)

(a) 1.52 m Hg (b) 1.96 m Hg (c) 77.2 m Hg (d) 91.2 m Hg

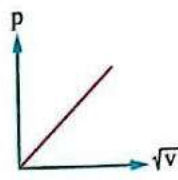
- 8 Which of the following graphs is correct, where (p) is the momentum of a body and (v) is the velocity of the body?



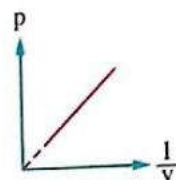
(a)



(b)



(c)



(d)

- 9 At inhalation, the air flows through the trachea with a speed of 15 cm/s. If the cross-sectional area of each of the two branches of the trachea are quarter that of the main trachea and considering the air flow is steady, the speed of the air flow in each branch is

(a) 7.5 cm/s (b) 15 cm/s (c) 30 cm/s (d) 45 cm/s

- 10 If the temperature of a certain amount of gas is raised by 10°C , the rise in the gas temperature on the Kelvin scale is K.

(a) 10 (b) 263 (c) 273 (d) 283

- 11 In the opposite figure, a cylinder equipped with a frictionless movable piston traps an amount of air. If the piston is moved slowly from position x to position y without any change in temperature, the pressure and density of the trapped air respectively will

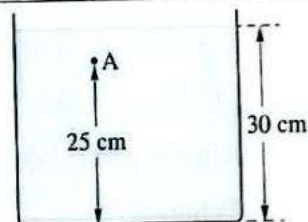


(a) increase, increase (b) increase, remain constant
(c) decrease, remain constant (d) decrease, increase

- 12 A test tube containing gas was sealed at STP. If its temperature is raised to 300°C keeping the gas volume constant, the gas pressure in cm Hg becomes

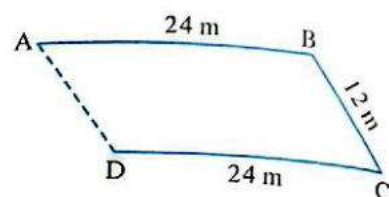
(a) 96.6 (b) 115.4 (c) 135.6 (d) 159.5

- 13 The opposite figure shows a glass tank containing water. If the pressure of water at point A is P, so the height of the point above the base of the tank at which the pressure of water is 4 P is equal to



(a) 10 cm (b) 15 cm (c) 12.5 cm (d) 20 cm

- 14** A parallelogram with dimensions as shown in the opposite figure. If a person moves on the perimeter of the parallelogram from point A to point B in 10 s, then from point B to point C in 6 s, then from point C to point D in 14 s, the magnitude of the average velocity moved by that person from point A to point D equals



- (a) 0.4 m/s (b) 0.8 m/s (c) 1.5 m/s (d) 2 m/s

- 15** If the tube in figure (1) is lifted up till the height of mercury inside it becomes 38 cm as shown in figure (2), so the height of the tube above mercury level is

(Where: $P_a = 76 \text{ cm Hg}$)

- (a) 38 cm (b) 60 cm
(c) 80 cm (d) 98 cm

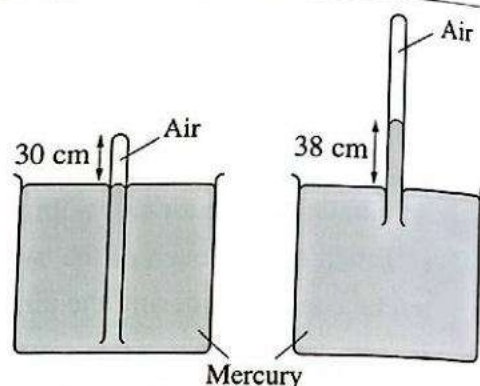
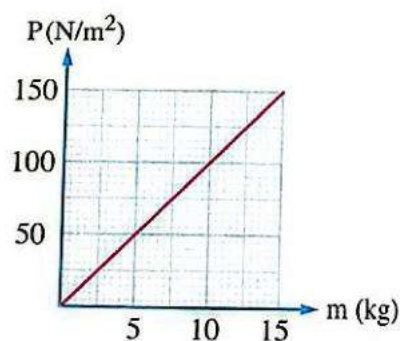


Figure (1)

Figure (2)

- 16** Multiple bodies with different masses are placed separately on a surface where the contact area of each of these bodies with the surface equals A. The opposite graph represents the relationship between the pressure (P) acting on the surface and the mass (m) for each body, so the contact area (A) is equal to



($g = 10 \text{ m/s}^2$)

- (a) 1 m^2 (b) 2 m^2 (c) 3 m^2 (d) 4 m^2

- 17** If the Earth exerts a gravitational force of 600 N on you, your body exerts a gravitational force on the Earth of a magnitude that is

- (a) zero (b) less than 600 N
(c) 600 N (d) greater than 600 N

- 18** A gas bubble is at depth 30 m under the water surface of a lake where the temperature is 4°C . If the bubble rises till reaching the water surface where the temperature becomes 10°C , then the percentage of the increase in the volume of the bubble is equal to

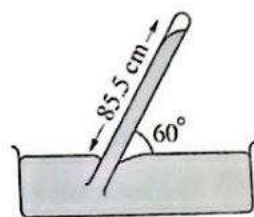
(Where: $\rho_{\text{water of the lake}} = 1.01 \times 10^3 \text{ kg/m}^3$, $g = 10 \text{ m/s}^2$, $P_a = 1.013 \times 10^5 \text{ N/m}^2$)

- (a) 3.078% (b) 4.078% (c) 307.8% (d) 407.8%

- 19 The opposite figure shows a mercury barometer whose tube is inclined at an angle of 60° to the horizontal level, so the value of atmospheric pressure is

(Given that: $g = 9.8 \text{ m/s}^2$, $\rho_{\text{mercury}} = 13600 \text{ kg/m}^3$)

- (a) $9.87 \times 10^4 \text{ N/m}^2$ (b) $1.013 \times 10^5 \text{ N/m}^2$
(c) $1.92 \times 10^5 \text{ N/m}^2$ (d) $3.86 \times 10^5 \text{ N/m}^2$



- 20 A car of mass 1200 kg was moving at a velocity of 20 m/s. If the driver applied the car's brakes, hence its velocity decreased to 8 m/s in 6 s. So, the magnitude and the direction of the average force acting on the car during this time interval are

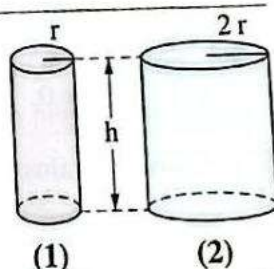
- (a) 2400 N, in the same direction of motion
(b) 2400 N, in the opposite direction of motion
(c) 1200 N, in the same direction of motion
(d) 1200 N, in the opposite direction of motion

Answer the following (21 : 24):

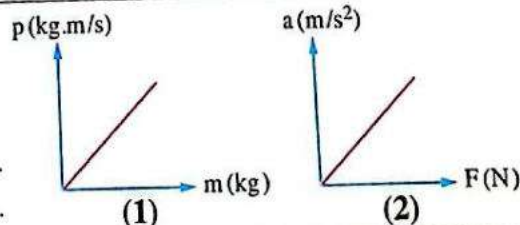
- 21 Honey flows faster in summer than in winter, what is the reason for this?

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- 22 The opposite figure shows two solid cylinders of different metals having the same mass, so calculate the ratio between the densities of the metals of the two cylinders $\left(\frac{\rho_1}{\rho_2}\right)$.



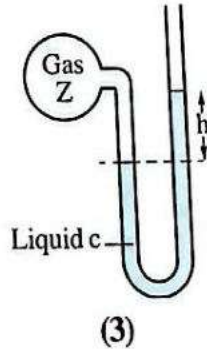
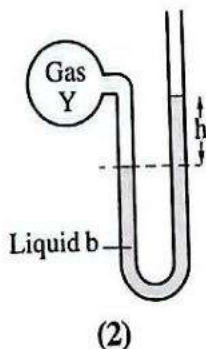
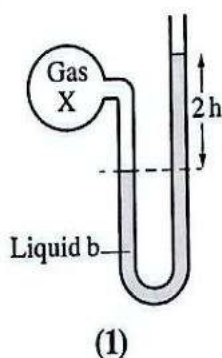
- 23 Write the mathematical relation and what the slope of the straight line equals for each of the opposite graphs.



- 24 In the following figures, which of the gases X, Y or Z has the least pressure?

And why?

(Where: $\rho_b > \rho_c$)



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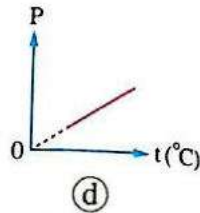
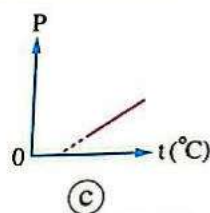
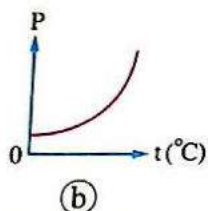
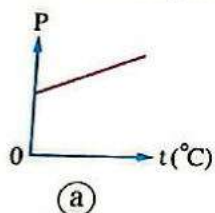
Exam 7 ? Answered

Choose the correct answer (1 : 20):

- 1** The ratio between the acting force on a body and the mass of this body according to Newton's second law is (Where: a is the body's acceleration)

(a) $0.5a$ (b) a (c) $1.5a$ (d) $2a$

- 2** Which of the following graphs expresses the relation between the pressure of a certain amount of gas and its temperature on the Celsius scale at constant volume?

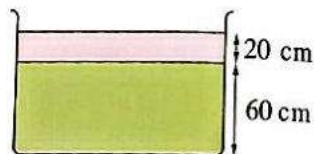


- 3** A car moves on the highway with uniform velocity of 120 km/h under the effect of pushing force F_1 as well as the frictional force F_2 , so



(a) $F_1 = F_2 \neq 0$ (b) $F_2 < F_1$ (c) $F_2 > F_1$ (d) $F_2 = F_1 = 0$

- 4** A tank contains two immiscible liquids of densities 700 kg/m^3 and 600 kg/m^3 having heights as shown in the opposite figure, given that the atmospheric pressure is $1.013 \times 10^5 \text{ N/m}^2$ and the acceleration due to gravity is 10 m/s^2 , so the total pressure on the base of the tank equals



(a) $4.123 \times 10^4 \text{ N/m}^2$ (b) $1.77 \times 10^4 \text{ N/m}^2$
(c) $1.067 \times 10^5 \text{ N/m}^2$ (d) $1.48 \times 10^5 \text{ N/m}^2$

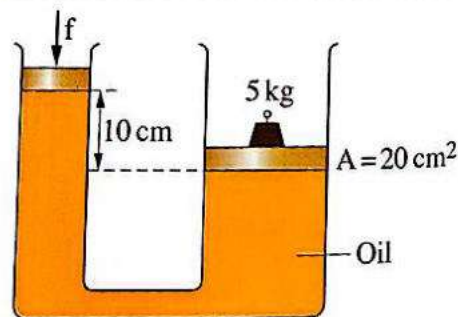
- 5** One femtosecond = microsecond.

(a) 10^{-10} (b) 10^{-9} (c) 10^9 (d) 10^6

- 6** Using the data recorded on the opposite hydraulic press, the pressure directly below the small piston is

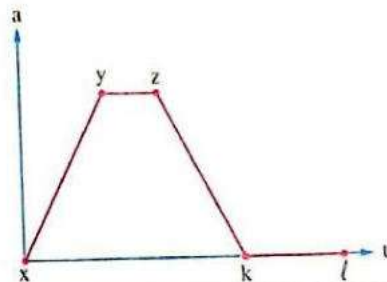
(Given that: $\rho_{\text{oil}} = 800 \text{ kg/m}^3$, $g = 10 \text{ m/s}^2$)

(a) $2.42 \times 10^4 \text{ N/m}^2$
(b) $2.6 \times 10^4 \text{ N/m}^2$
(c) $1.02 \times 10^3 \text{ N/m}^2$
(d) $1.48 \times 10^3 \text{ N/m}^2$



- 7 The opposite graph represents the change in the acceleration (a) of a body that starts its motion from rest in a straight line with time (t), at which stage the momentum of the body is constant?

(a) Stage xy. (b) Stage yz.
(c) Stage zk. (d) Stage kl.



- 8 A pipe of radius 3.5 cm has water flowing steadily through it at a speed of 3 m/s into a cubic tank of side length of 226 cm, so the time required to fill the tank is approximately equal to ($\pi = 3.14$)

(a) 900 s (b) 1000 s (c) 1100 s (d) 1200 s

- 9 The dimensional formula for pressure is

(a) MLT^{-2} (b) ML^2T^{-2} (c) $ML^{-1}T^{-2}$ (d) ML^0T^{-2}

- 10 A person runs on a rectangular path of dimensions 50 m, 40 m and completes a full cycle in a time of 100 s, so the magnitude of the person's average velocity is

(a) 9 m/s (b) 1.8 m/s (c) 0.9 m/s (d) 0

- 11 A solid iron cube has a side length of 10 cm and a mass of 7.72 kg, and a solid gold cuboid has dimensions 20 cm, 10 cm, 5 cm and a mass of 19.3 kg. The ratio between the density of iron and the density of gold ($\frac{\rho_{Fe}}{\rho_{Au}}$) is

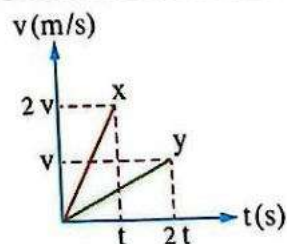
(a) $\frac{3}{10}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{3}{4}$

- 12 An ideal gas occupies a volume of 100 cm^3 at a temperature of 27°C . If the gas is heated at constant pressure to a temperature of 327°C , the gas volume becomes

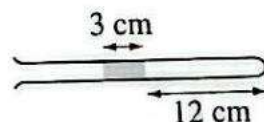
(a) 120 cm^3 (b) 109 cm^3 (c) 1211 cm^3 (d) 200 cm^3

- 13 From the opposite graph, the ratio between the accelerations of the two bodies ($\frac{a_x}{a_y}$) is

(a) $\frac{4}{1}$ (b) $\frac{2}{1}$
(c) $\frac{1}{2}$ (d) $\frac{1}{4}$



- 14 The opposite figure shows a capillary tube of uniform cross-section containing a thread of mercury that traps an amount of air. If the tube is positioned vertically where its open end becomes downward while the temperature is held constant, the length of the trapped air column becomes



(Where: $P_a = 76 \text{ cm Hg}$)

(a) 16.6 cm (b) 15.6 cm (c) 12.5 cm (d) 11.5 cm

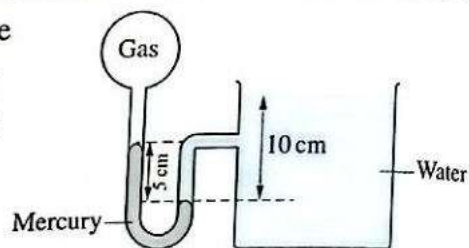
- 15 An amount of argon gas has a density of 1.56 kg/m^3 at STP, so if this amount of gas is pumped into a vacuumed light bulb of capacity 100 cm^3 , then the temperature of the gas inside the bulb becomes 55°C , its pressure becomes 700 mm Hg , the mass of this amount of argon gas equals

(a) $2 \times 10^{-4} \text{ kg}$ (b) $1.2 \times 10^{-4} \text{ kg}$ (c) $1.5 \times 10^{-4} \text{ kg}$ (d) 10^{-4} kg

- 16 The statement that does not apply to the forces of action and reaction is

(a) the magnitude of the action force = the magnitude of the reaction force
 (b) the action force opposes the reaction force
 (c) the action force and the reaction force act on the same body
 (d) the action force and the reaction force act on two different bodies

- 17 The opposite figure shows a mercury manometer, one of its branches is connected to a reservoir containing a trapped gas and the other branch is connected to an open water tank, so the pressure of the trapped gas equals



(Given that: $P_a = 75 \text{ cm Hg}$, $\rho_{\text{Hg}} = 13600 \text{ kg/m}^3$,

$\rho_w = 1000 \text{ kg/m}^3$, $g = 10 \text{ m/s}^2$)

(a) $10.19 \times 10^6 \text{ N/m}^2$ (b) $1.09 \times 10^5 \text{ N/m}^2$ (c) $9.62 \times 10^4 \text{ N/m}^2$ (d) $8.89 \times 10^4 \text{ N/m}^2$

- 18 Two open boxes (1) and (2) are placed next to each other, box (1) has a cubic shape of side length l while box (2) has a cuboid shape of base dimensions $\frac{l}{4}$, $\frac{l}{2}$ and height l , so

(a) the atmospheric pressure on the base of box (1) is greater
 (b) the atmospheric pressure on the base of box (2) is greater
 (c) the force due to air pressure on the base of box (1) is greater
 (d) the force due to air pressure on the base of box (2) is greater

- 19 Figure (1) shows a cylindrical container equipped with a movable frictionless piston of mass 16 g and cross-sectional area 160 cm^2 that is containing an amount of gas of volume 0.01 m^3 under the standard atmospheric pressure. If an amount of mercury is put above the piston as shown in figure (2) while keeping the temperature constant, the piston will move a distance downwards that equals

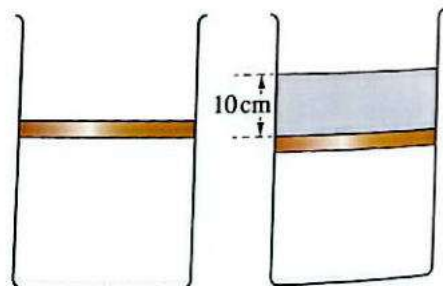


Figure (1)

Figure (2)

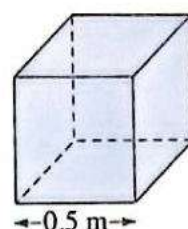
(Where: the atmospheric pressure = 10^5 N/m^2 ,

the acceleration due to gravity = 10 m/s^2 ,

the density of mercury = 13600 kg/m^3)

(a) 3.25 cm (b) 5.5 cm (c) 6.25 cm (d) 7.5 cm

- 20 The opposite figure shows a solid metal cube of mass 340 kg that is placed on a horizontal surface, then the cube acts on the horizontal surface with a pressure that equals
(Take: $g = 10 \text{ m/s}^2$)



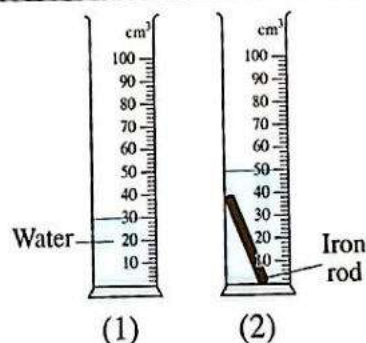
- (a) 680 N/m^2 (b) 1360 N/m^2
(c) 6800 N/m^2 (d) 13600 N/m^2

Answer the following (21 : 24):

- 21 An egg breaks when it falls on the ground but does not break when it falls on a pillow from the same height. **Explain this.**

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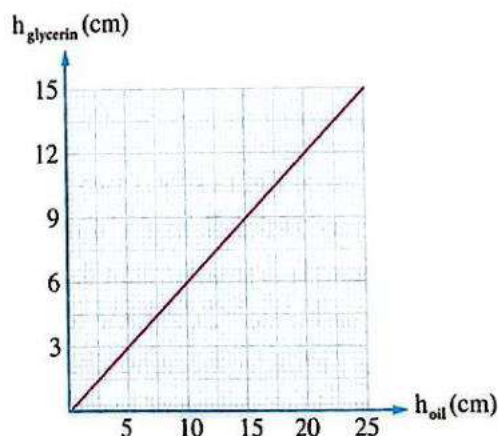
- 22 A student wanted to determine the mass of a solid iron rod. He followed the steps shown in the opposite figure. If you know that the density of iron is 7.87 g/cm^3 , **calculate** the mass of the iron rod.



- 23 What happens to the net force acting on a metal body during its fall through a viscous liquid?

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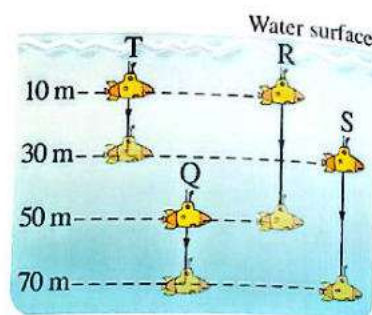
- 24 A U-shaped tube contains a quantity of glycerin of density 1260 kg/m^3 . Oil is poured gradually into one of its branches. If the opposite graph shows the relation between the heights of both oil and glycerin above the level of interface between the two liquids at equilibrium, **calculate** the density of the oil.



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Choose the correct answer (1 : 20):

- 1 The opposite figure shows four submarines T, Q, R and S diving at different depths under water surface of constant density. If the submarines have moved from initial depth to final depth as shown in the figure, so which of them will experience a pressure increase of



	Lowest value	Highest value
(a)	submarines T, Q	submarines R, S
(b)	submarines T, Q	submarine S only
(c)	submarine T only	submarines R, S
(d)	submarine T only	submarine S only

- 2 The ratio of the density of electrolyte solution in a car battery after discharging the battery to its density after recharging it is

- (a) greater than 1 (b) equal to 1
(c) less than 1 (d) the answer cannot be determined

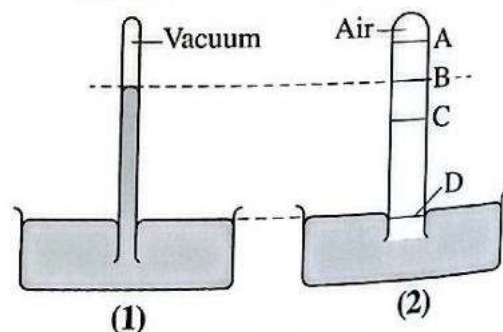
- 3 Three physical quantities (X, Y, Z) have dimensional formulas of MLT^{-1} , MLT^{-2} , and T respectively. Which of the following relationships could possibly be correct?

- (a) $Z = X \cdot Y$ (b) $Z = \frac{X}{Y}$ (c) $Z = \frac{Y}{X}$ (d) $Z = \frac{Y^2}{X}$

- 4 Two mercury barometer tubes are placed in one mercury basin, the cross-sectional area of the first tube is half that of the second, then the ratio between the heights of mercury columns in the two tubes above the surface of mercury in the basin respectively is

- (a) $\frac{2}{1}$ (b) $\frac{1}{1}$ (c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$

- 5 The opposite figure shows two adjacent mercury barometers. If the diameter of the tube of barometer (1) is smaller than the diameter of the tube of barometer (2), and the tube of barometer (2) contains air under the atmospheric pressure, so at which level in the tube of barometer (2) is the level of the mercury surface?



- (a) Level A (b) Level B (c) Level C (d) Level D

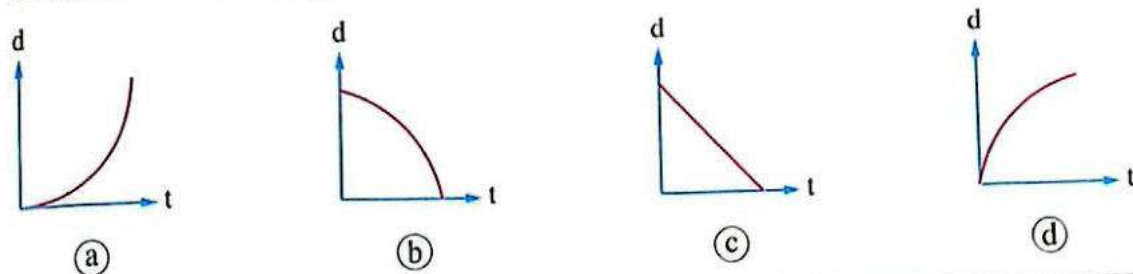
- 6 A well sealed cylinder containing natural gas can withstand pressure up to maximum of 14.9 atm, so if the gas pressure in the cylinder was 12 atm at temperature of 27°C , then if a fire breaks out in the building, so by ignoring the expansion of the cylinder, the minimum temperature that cause explosion of the cylinder is approximately

(a) 99°C (b) 100°C (c) 110°C (d) 115°C

- 7 A layer of viscous liquid of thickness 2.5 mm covers a ceramic floor. If a square plate of area of 0.1 m^2 slides on it at a uniform velocity of 0.5 m/s due to a tangential force of 35 N, the viscosity coefficient of the liquid equals

(a) 0.75 N.s/m^2 (b) 1.25 N.s/m^2 (c) 1.75 N.s/m^2 (d) 2.25 N.s/m^2

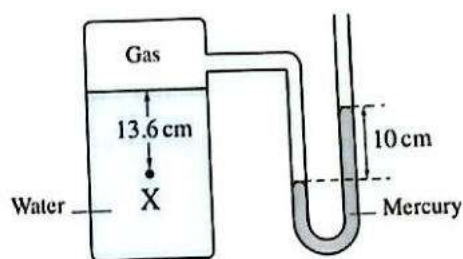
- 8 Which of the following figures could represent the (displacement-time) graph for a body with zero net force acting on it?



- 9 A mercury manometer is connected to a tank containing an amount of water as shown in the opposite figure, so the pressure at point X is

(Where: $\rho_{\text{Hg}} = 13.6 \rho_{\text{water}}$, $P_a = 76\text{ cm Hg}$)

(a) 77 cm Hg (b) 78 cm Hg
(c) 87 cm Hg (d) 91 cm Hg



- 10 A hydraulic press has two pistons of diameters of 4.5 cm and 30 cm. If the two pistons are balanced at one horizontal level when a force of 500 N is applied to the small piston, the resulting force on the large piston is approximately

(a) 22 kN (b) 33 kN (c) 44 kN (d) 66 kN

- 11 If 30 cm^3 of a liquid (a) whose density is 1200 kg/m^3 gets mixed with 50 cm^3 of liquid (b) whose density is 850 kg/m^3 such that the total volume of the mixture is equal to the sum of the volumes of the two liquids before mixing, the density of the mixture is approximately equal to

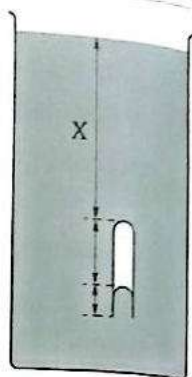
(a) 750 kg/m^3 (b) 981 kg/m^3 (c) 1250 kg/m^3 (d) 1350 kg/m^3

- 12 If the directions of both velocity and acceleration of a body are negative
- (a) the body speed increases (b) the body speed decreases
(c) the body moves at a constant speed (d) the body stops moving

- 13 The opposite figure shows a 15 cm long tube of uniform cross-section. If the tube is submerged upside down in a beaker that contains mercury without letting air leak out of the tube till mercury rises inside the tube to a length of 5 cm and by assuming that the temperature is constant, the distance X equals

(Where: $P_a = 76 \text{ cm Hg}$)

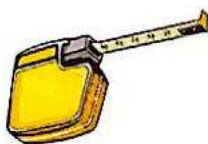
- (a) 20 cm (b) 24 cm
(c) 28 cm (d) 38 cm



- 14 Which of the following measuring tools is most suitable for measuring the thickness of a book page?



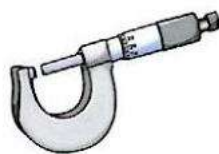
(a)



(b)



(c)



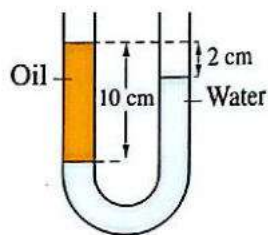
(d)

- 15 Two bodies have the same momentum. The mass of the first is 5 kg and its velocity is 20 m/s. If the mass of the second is 15 kg, its velocity equals

- (a) 0.15 m/s (b) 5.55 m/s (c) 6.67 m/s (d) 20 m/s

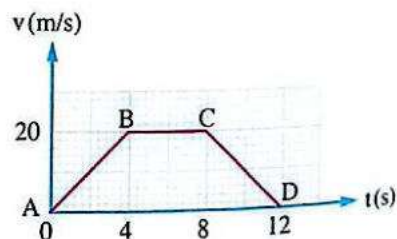
- 16 The opposite figure shows a U-shaped tube of uniform cross-sectional area. If the density of water is 1000 kg/m^3 , then the density of oil equals

- (a) 200 kg/m^3 (b) 800 kg/m^3
(c) 1000 kg/m^3 (d) 1300 kg/m^3



- 17 The opposite figure represents the velocity-time graph for a body moving in a straight line, so the acceleration of the body during its motion from C to D equals

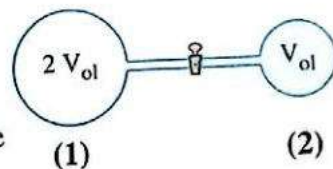
- (a) -5 m/s^2 (b) -4 m/s^2
(c) -2.5 m/s^2 (d) -1.6 m/s^2



- 18 A cylinder equipped with a movable piston is trapping an amount of a gas of volume 10 L under pressure P and absolute temperature T . If the piston is pressed to make the pressure of the gas become $3P$ and at the same time its temperature is increased by $0.8T$, then the volume of the trapped gas (V_{ol}) becomes

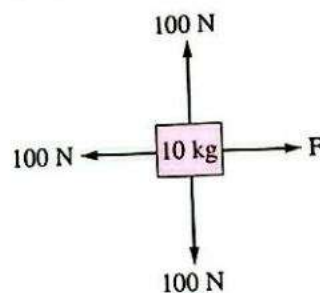
(a) 2.7 L (b) 6 L (c) 16.7 L (d) 54 L

- 19 The opposite figure shows two gas containers (1), (2) of capacities $2V_{ol}$ and V_{ol} respectively connected together by a tube of negligible volume that is equipped with a valve, container (1) is vacuumed and container (2) contains a gas. If the valve between the two containers is opened slowly while holding the temperature constant. The pressure of the contained gas will



(a) decrease to the half (b) increase to the double
(c) decrease to one third (d) increase to the triple

- 20 In the opposite figure, four forces are acting on a mass of 10 kg. If the mass is moving with an acceleration of 10 m/s^2 , the magnitude of force F equals
(Take: $g = 10 \text{ m/s}^2$)



(a) 50 N (b) 100 N
(c) 150 N (d) 200 N

Answer the following (21 : 24):

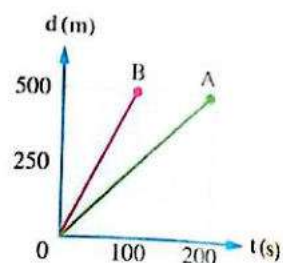
- 21 In light of your study of Newton's third law, suggest a way for a spacecraft to change its direction outside the atmosphere.

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- 22 An empty tank gets filled with an amount of kerosene of mass 100 kg using a hose where the kerosene emerges from its nozzle with a speed of 0.2 m/s , so if the tank is filled during 25 minutes, calculate the radius of the hose nozzle.
(Knowing that: Density of kerosene = 900 kg/m^3 , $\pi = 3.14$)

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- 23** The opposite graph represents the relation between displacement and time for two bodies, A and B, that have started to move from rest in a straight line. Which of the two bodies is faster? And why?



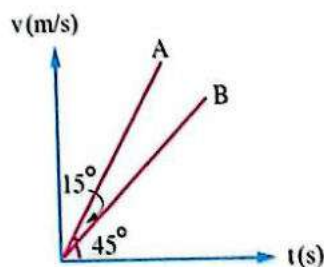
- 24** If the volume of a gas at 0°C is 450 cm^3 , what will be its volume at 91°C , assuming its pressure remains constant?

Exam 9

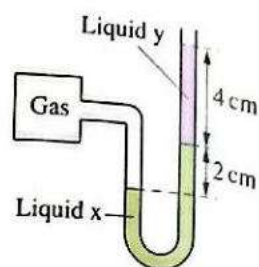
Answered

Choose the correct answer (1 : 20):

- 1 A person tried to push a box of mass 50 kg placed on a rough horizontal surface but he couldn't, so the net force acting on the box is
($g = 10 \text{ m/s}^2$)
(a) 0 (b) 50 N (c) 500 N (d) an unknown value
- 2 Firefighters use hoses with narrow nozzles when extinguishing fires because the speed of water ejection
(a) increases as the cross-sectional area decreases
(b) decreases as the cross-sectional area decreases
(c) increases as the cross-sectional area increases
(d) is constant regardless of the change in cross-sectional area
- 3 A quantity of gas under a pressure of 10 cm Hg had a volume of 600 cm^3 . If its pressure became 30 cm Hg while the temperature remained constant, its volume becomes
(a) 100 cm^3 (b) 200 cm^3 (c) 300 cm^3 (d) 400 cm^3
- 4 All of the following are true when using an ideal hydraulic press except that
(a) one of the pistons moves a greater distance than the other piston
(b) the force acting on one of the pistons is greater than the force acting on the other piston
(c) the cross-sectional area of one of the pistons is larger than the cross-sectional area of the other piston
(d) the work done on one of the pistons is greater than the work produced by the other piston
- 5 Five similar solid iron balls, each of mass 100 g, are put in a graduated cylinder containing 86.4 cm^3 of water, then the level of water in the graduated cylinder will rise to indicate a volume of
(Take: $\rho_{\text{iron}} = 7800 \text{ kg/m}^3$)
(a) 22.3 cm^3 (b) 64.1 cm^3 (c) 150.5 cm^3 (d) 186.4 cm^3
- 6 If the relative density of glycerin is 1.26, then the mass of 1 liter of it equals kg.
(Given that: $\rho_{\text{water}} = 1000 \text{ kg/m}^3$)
(a) 1260 (b) 1.26 (c) 1.26×10^{-3} (d) 12.6
- 7 The opposite figure represents the velocity-time graph for two different bodies, A and B, moving in a straight line, so the ratio between the accelerations of the two bodies ($\frac{a_B}{a_A}$) is
(a) $\frac{1}{2}$ (b) 2
(c) $\frac{1}{3}$ (d) 0.577



- 8 The opposite figure shows a gas reservoir connected to a manometer containing two non-mixing liquids (x and y) of densities 1250 kg/m^3 and 625 kg/m^3 , so the pressure difference between the gas in the reservoir and the atmospheric pressure is ($g = 10 \text{ m/s}^2$)

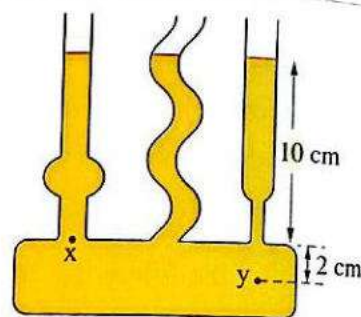


- (a) 250 N/m^2 (b) 375 N/m^2
(c) 500 N/m^2 (d) 576 N/m^2

- 9 $\frac{1}{21600}$ of the average solar day is equivalent to second.

- (a) $\frac{1}{4}$ (b) 4 (c) $\frac{1}{3}$ (d) 3

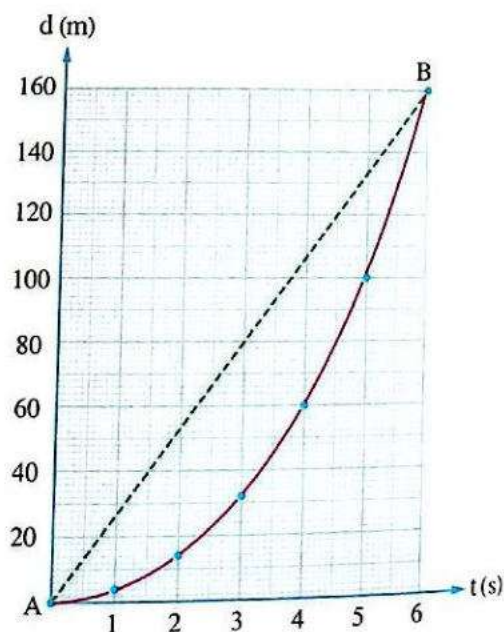
- 10 The opposite figure shows number of connected vessels that contain oil of density 800 kg/m^3 , then the ratio between the pressures of the oil at the two points x and y ($\frac{P_x}{P_y}$) is (Take: $g = 10 \text{ m/s}^2$)



- (a) $\frac{5}{6}$ (b) $\frac{6}{5}$
(c) $\frac{3}{2}$ (d) $\frac{2}{3}$

- 11 The opposite figure represents the (displacement-time) graph for an object that moves in a straight line within 6 seconds, so the slope of the dashed straight line AB is

- (a) greater than the average velocity of the object within the 6 seconds
(b) less than the average velocity of the object within the 6 seconds
(c) less than the instantaneous velocity of the object at the sixth second
(d) equal to the instantaneous velocity of the object at the sixth second



- 12 A certain amount of gas is at 10°C . What is the temperature at which the pressure of this amount doubles while its volume is kept constant?

- (a) 20°C (b) 80°C (c) 160°C (d) 293°C

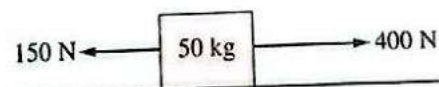
- 13 A bowling ball of mass 4.6 kg moves at a speed v on a lane. What is the speed at which a golf ball of mass 46 g must move to have the same magnitude of momentum as the bowling ball?

(a) $0.01 v$ (b) $5 v$ (c) $10 v$ (d) $100 v$

- 14 A liquid layer of viscosity coefficient 1.8 kg/m.s and a thickness of 4.5 mm is placed between two horizontal and parallel flat plates. If a tangential force of 32 N acts on the upper plate so that it moves at a velocity of 1 m/s , the area of the upper plate equals m^2 .

(a) 0.02 (b) 0.04 (c) 0.06 (d) 0.08

- 15 In the opposite figure, the magnitude of the resultant force that acts on the mass and its acceleration respectively are



(a) $550 \text{ N}, 11 \text{ m/s}^2$ (b) $250 \text{ N}, 5 \text{ m/s}^2$ (c) $550 \text{ N}, 5 \text{ m/s}^2$ (d) $250 \text{ N}, 11 \text{ m/s}^2$

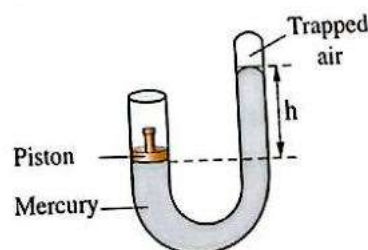
- 16 A balloon is filled with an amount of helium gas that has a volume of 100 m^3 at a temperature of 27°C and under a pressure of 2 atm . If the balloon has risen upwards to a height where the temperature has become 3°C and the pressure of the helium has become 1.5 atm , the volume of the balloon becomes

(a) 96.6 m^3 (b) 99.3 m^3 (c) 100.1 m^3 (d) 122.7 m^3

- 17 A car is moving in a straight line in which a person not wearing a seatbelt. If the car stops suddenly, then

(a) the person and the car will stop together (b) the person will stop faster than the car
(c) the person will lurch forward (d) the person will move backward

- 18 The opposite figure shows a U-shaped tube, one of its arms is closed while the other arm is open and equipped with a frictionless piston of area $5 \times 10^{-4} \text{ m}^2$ and mass 5 kg . If the tube contains a quantity of mercury that traps a quantity of air in the closed arm at pressure of $1.626 \times 10^5 \text{ Pa}$, the height of the mercury column (h) equals



(Where: $\rho_{\text{Hg}} = 13600 \text{ kg/m}^3$, atmospheric pressure = 10^5 Pa , $g = 10 \text{ m/s}^2$)

(a) 60.3 cm (b) 44.5 cm (c) 39.4 cm (d) 27.5 cm

- 19 If the dimensional formula of physical quantity A is M^2LT^{-2} and the dimensional formula of physical quantity B is M^2LT^{-2} , then the dimensional formula of the quantity $(4A \times 2B)$ is

(a) $M^4L^2T^{-4}$ (b) $M^{-4}L^{-2}T^4$
(c) M^2LT^{-2} (d) has no physical meaning

- 20** A U-shaped tube of uniform cross-section containing a suitable amount of mercury. Two different quantities of water are poured in its arms, so the liquids become balanced as in the opposite figure, so the value of h is

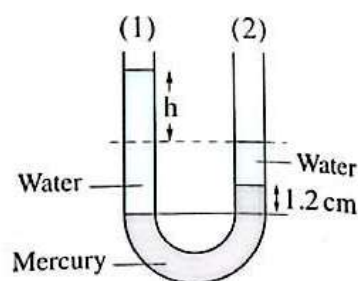
(Where: $\rho_{\text{Hg}} = 13600 \text{ kg/m}^3$, $\rho_w = 1000 \text{ kg/m}^3$)

(a) 12.22 cm

(b) 13.14 cm

(c) 15.12 cm

(d) 16.32 cm



Answer the following (21 : 24):

- 21** What happens to a group of boxes placed on top of a car and not tied down when the car suddenly starts to move and when it suddenly stops? And why?

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- 22** Two men were fixing a weak roof by putting a wooden plate of weight 400 N on the roof. If the contact area of the plate with the roof was 0.8 m^2 and the weight of both men together was 1600 N, **calculate** the total pressure that affects the roof due to the weight of the plate and the two men when they stand above the plate.

.....

- 23** In an ideal hydraulic press, the small piston was acted upon by a force f that moved it down a distance ($y_1 = 6 \text{ cm}$), causing the large piston to move up a distance ($y_2 = 2 \text{ cm}$) under the influence of a force F . **Calculate** the mechanical advantage of the hydraulic press when the pistons are balanced.

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- 24** If the volume of a quantity of a gas at a temperature of 120°C is 4 liters, **calculate** the temperature of the gas on the Kelvin scale when its volume is 1 liter, at constant pressure.

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كيفية طباعة صفحات معينة من ملف معين

مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9

